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ART. I.—*Extracts from Professor Johnson's Lectures before the Royal Society and Central School of Horticulture and Agriculture, England.*

THE period of the duration of roots varies much, and the plants are termed annual, biennial, or perennial, according as they last for one, two, or several years. The life of an annual plant is an epitome of that of flowering plants generally, which only last till the period of maturation, and when they are perpetuated, this being only from a constant succession of new plants round the bulb. The cause of plants enduring for a longer period than year to year, probably consists from their storing up a larger supply of nutriment than is required for the purposes of its life. A herbaceous plant after the first shoot developes itself, and then produces flowers and seeds; a larger portion of nutriment in the root than what is required for the subsistence of the plant, enables the centre to throw out a large number of buds around it.

If we examine a section of a twig by the microscope, we find the centre occupied with medullary matter or pith, around which is a medullary sheath, formed of woody fibre and spiral vessels. As the tree grows older, the pith becomes contracted into a smaller diameter, as well as the sheath, and a mass of other matter is formed; the pith of the yearling twig becomes a dark spot in the centre.

That the woody matter is developed downwards, may be proved by a simple experiment, that of making a continuous wound around any tree or branch, which will be found to enlarge above, but remain of the same size below, and the same effect will be produced if a ligature is tied round any part. It may also be seen, if we cut off the bark from a piece of elder, when the thin woody fibres may be seen descending an inch or two below the bud. In the progress of their descent to the soil, these fibres occasionally meet with impediments, and they then take a circuitous route. It is this which forms the knots that give beauty to wood, that is esteemed by the cabinet maker. In a well proportioned stem, the grain is uniform from top to bottom, but in a pollard we find many of these curvatures, which give to the wood its beauty of appearance. One of the most beautiful specimens of variegated wood is that of the old Fairlop oak, which was a pollard of large extent, and part of which was made into a reading-desk, which is now used at St. Pancras New Church. In spring, when the buds expand, the bark is easily separable from the wood, and this is from a secretion of viscid fluid, ealled cambium, which is probably the food for the supply of the descending fibres. Many trees are decayed in the inside whilst they are yet covered with verdure; and a most interesting instance of this is afforded in the Salsey oak, near Northampton, the age of which is computed at nearly a thousand years, and which is now a mere shell, from the decay of the interior. If, however, a wound is made round the bark, it uniformly dies, as no nutriment can be conveyed to the inner portions of the tree. This operation, termed girdling, is extensively practised in the back settlements of America, prior to the felling of the timber in clearing land, as the upper portion of the tree never vegetates. There will be an occasional development, because sufficient nutriment may be left in the tree to cause the buds to expand for one year. There appears to be no assignable limit to the growth of an exogenous or outward growing tree, and judging from appearance, many have attained a very enormous age; the number of 1,000 and upwards of circles, indicating the successive annual developments of wood, having been occasionally observed. An attention to the age of trees is of very great value to antiquarian researches. Near the great lakes of North America is a very extensive artificial embankment, which it is evident could never have been constructed by the present race of

Indians, and is about five or six feet high, evidently constituting a great continued barrier from the north side of Lake Ontario to the vast plains of the Mississippi, upon which trees are growing. On carefully counting the rings, it is ascertained that they must have grown there for upwards of 400 or 500 years, and it may be presumed that they were abandoned some time previously. This brings the date to a very remote period, and we may hazard the conjecture that they were the works of the ancient Mexicans, prior to their migration to the south, a record of which event is preserved in the traditions of this people, as well as in their hieroglyphical inscriptions. M. Bose has assigned the growth of trees, as one foot in diameter for every one hundred years; but this calculation is found to be fallacious. The celebrated Golenos oak, near Newport, which was felled in 1810, full of luxuriant growth, was 9 1-2 feet in diameter, from which it should have been considered, according to this data, to be 950 years old, whilst the number of circles was only 450. When the main trunk was sawn through, there was found embedded in it, about six feet from the ground, a large stone, the lodgment of which, as well as toads and serpents, is easily accounted for, by their obtaining access into any hole made by accident, and the wood growing over it, so that, if animals, they have been prevented making their escape. In scarcely one section of a tree do we find the pith in the exact centre of the mass, but with a great inclination to the south, which is accounted for, by the number of buds being greater in the vessels more expanded, and the fibres deriving more nutriment in the part exposed to the sun.

Next to the stem, the leaves are the most prominent portion of the plant. They appear to be formed from the expansion of the minute vessels of the stem; the veins have a connection with the medullary sheath surrounding the pith. Both the upper and under parts of the leaf are composed of a network of fibres: this may easily be seen in walking through the woods in summer, in leaves which have lain a long time upon the ground, where the cuticle has been removed by insects forming them into skeletons. These may also be formed by the simple artificial process of maceration in water, which decomposes the cuticle. These dissections are of value in vegetable physiology, rendering us familiar with the various forms of the leaf. Of all the various parts of vegetation, these are the

most ornamental. Flowers last only for a short time—a day, a week, or a month, when all their beauty is gone; but most trees retain their foliage for half a year, and those in green-houses through the whole year. The functions which they perform are not accurately ascertained, although conjecture has exhausted itself upon the subject. The functions they perform have been considered analogous to all the involuntary ones of animals; they have been considered as perspiratory, absorbent, and digestive organs, mediums for conveying the agency of electricity, lungs, &c. This last opinion is the most prevalent, but their action may be modified much by time, place, or habit, as well as growth. Unhappily, no department of science is so little known as vegetable physiology, although volumes have been written upon the subject. By an examination of the human body, and a careful dissection of its parts, we are enabled to determine the various parts and functions, and are assisted in this also by the aid which the analogy of the examination of animals presents. We are enabled by this examination to arrive at a tolerably correct view of the nature of the lowest grade of animal which exists; but the organs of vegetables are so different, and their general economy so peculiar, that we cannot possibly arrive at any conclusions from analogy. Their gradual growth and development, and at a certain period their decay, show that they are exceptions to the inertia of matter. By the aid of the microscope we can recognize a series of vessels in which circulation is going on; but comparison goes no further, and beyond this we can only be guided by conjecture.

Many generations since it was found that a plant would grow under the exhausted receiver of an air-pump, provided some of the leaves were exposed to the external atmosphere. If a plant be confined under a glass, it will grow for a long time; but if it be prevented from receiving a supply of pure air, it becomes unhealthy, and ultimately dies, on account of a change which takes place in its composition from the growing plant. Air which has passed through the lungs, is deprived of the property of supporting life or combustion; and the same change takes place in the air where growing vegetables are confined. This may easily be shown by putting saxifrage into a bottle, by which the air becomes vitiated, as may be shown by transferring it into jars, and making it the subject of experiment. As oxygen is destroyed by animals, it was a favo-

rite opinion that vegetables live upon the gas that is formed from it, and expel oxygen to replace that which is exhausted in the first instance. This was first suggested by Dr Priestly, who, however, so far from insisting upon it, did not offer it as his own. The theory was so plausible that it was generally adopted, though few ventured to examine it; and the notion of course prevailed, that what was poisoned by animals was purified by plants. The same effect is however, produced on air by plants as by animals, in the conversion of oxygen gas into carbonic acid, formed of the former gas united with carbon, or the basis of charcoal. This experiment is so simple, that it may be easily performed; and similar results will take place in hundreds of experiments, not only with plants in pots, but from introducing branches under the receiver. So far from rendering fit for respiration that which has been unfit, the plant uniformly dies; the atmosphere in which it grows having a powerful effect in destroying it. Plants are incapable of existing in any kind of air which will not support animal life or combustion.

Some have asserted that plants possess a twofold character: that under the influence of the sun they respire carbonic acid and throw out oxygen, and at night the reverse takes place. This opinion it is, however, difficult to support, as nature never takes the trouble of a twofold operation when one is sufficient for her purpose; and it implies that there are two sets of vessels which act alternately, or that the vessels are provided with different appurtenances at different periods—that what is rejected as poison in one twelve hours, supports the plant the remaining portion of the day.

The late Professor Burnett supposed two different operations in plants, one by day and the other by night; one of which was constantly going on, whilst the other required the influence of the sun to bring it into action. He supposed, that in the day they absorbed moisture from the leaves, and during digestion threw out oxygen gas; that, as with animals the taking in of food is suspended during the night, the functions of respiration alone go on, as in the former case, contaminating the atmosphere. These opinions were, however, only supported by a few ill-conducted and inconclusive experiments. Every grower must have noticed that plants grow a great deal more in the night than in the day; and how can this be reconciled with the opinion that digestion only takes place in the latter? This is more particularly the case with tropical plants; the leaves,

as well as the stems of the banana and plantain, being known to increase three or four inches in size.

That light possesses a great influence upon plants, is evident from the fact of their always turning their leaves towards it. It is the upper surface which is directed towards it; and this disposition is perhaps given to prevent the stomata from being influenced by the sun's rays, and thus rendered incapable of performing the functions for which nature intended them. If we anoint the upper surface of a leaf with oil, it soon dies; being fatal to insects in a similar way, by filling up the pores of the bodies through which they breathe. The leaf is affected in a similar manner; and water will have a like effect in injuring or destroying their organization; if we drip water constantly upon a plant it will be destroyed. The leaves of trees growing naturally near the ocean, have a covering to preserve the foliage from the spray of the sea; and those which do not have it, when placed in these situations, soon die. Trees may often be seen inland, many miles from the sea, with their foliage blackened, owing to the spray being carried so far by a strong wind. On one occasion, between Canterbury and Dover, the only vegetables that were witnessed green were the turnips, which, like cabbages, have their origin near the sea-side. Where the texture of the leaves will not repel the salt spray, the salt will lie and perish the plant; but where covered, the plant resists it. On cabbages the drops of rain may be seen like globules of quicksilver; if it were not for this repelling power, the water would lay too long and impede respiration. Plants grown without light are much less solid than others; and they contain a less proportion of carbon, growing luxuriant but blanched. Gardeners avail themselves of this property to correct those plants which are hurtful or have a bad taste; and what are noxious, are thus rendered wholesome. Green being produced from yellow and blue colors, it is possible that the blue is produced by oxygen, through the action of light, as other plants are pale yellow. Cultivation has a very great effect in modifying plants; but it generally renders them far less luxuriant. In variegated plants, the functions are far less active than in those of natural growth, and not near so vigorous.

The blood of animals passes through two extensive series of vessels, in which those changes take place, fitting it for use in the animal economy. Although we have not actually discovered two series

of circulating vessels, or a centre of circulation in plants, we are no less certain that there are two sets of vessels in the leaves; and analogy leads us to suppose, that they are for the same purpose as those of animals. Some curious phenomena connected with this are observable in parasitic plants. A certain series of these grow on the pots of others, from which they appear to derive their nutriment. These are of a brownish or yellowish color; the leaves, instead of being broad, are but dry scales, and possess no effect when confined in air or upon oxygen; and no stomata can be detected by the microscope. We find a connection between these and the bark; and they appear to feed upon the elaborated sap which has gone through all the changes essential to vegetable existence. Others, the leaves of which are green, as in the misletoe, appear to be connected with the wood; and these may be considered as the two different descriptions of the blood of the plant. The mode by which plants derive their vitality from the soil, is the solution of nutritive matter by water. Those soils which are capable of imbibing or retaining water, are the most favorable to vegetation, provided they contain a proper quantity of that principle which gives solidity of parts. Carbon is not acted upon by the fibres of the root in its solid state or combined with the soil; but, as experiments on many kinds of manure prove, by imbibing the oxygen of the atmosphere, and forming carbonic acid gas, which is then absorbed by water and conveyed into the roots. Perhaps the greater growth of vegetables in the spring is, that the heat of the sun promotes the decomposition of organic matters, whilst light electric rains descending, convey the carbonic acid formed into the soil; and it may probably be accelerated, that organic tissue is rendered more active from the dormant state in which it has long lain. The whole of leaves are formed of double masses of fibres, the upper series being connected with the medullary sheath, and the lower series with the inner part of the bark. On the latter are deposited the resin, sugar, and other substances which plants secrete; and both probably act the double part of veins and arteries in animals, the upper series being analogous to arteries, and the lower series to those vessels which carry out blood to all parts of the system.

The early portion of the lecture was accompanied by several experiments illustrative of atmospheric air, and the action of vegetation upon it.

The next subject to which I propose to draw attention, is the structure of the flower. The most important parts are the calyx or flower cup, and the corolla enclosed in it, and those parts are called the floral envelopes. There are also a great number of minute organs, which are most important parts of the plant; these are the stamens and pistils, which perform peculiar parts in the functions of the flower. These complicated and interesting parts of the flower are only extensions of the branches; and the varied parts of the flowers may easily be known by an attention to the formation and parts of the leaves which produce the various modified parts of the plant, the calyx, corolla, stamens, and pistils. The organs of reproduction derive their origin from the axils of the leaves, the points of connection between these and the stem. In those where the vital energy is the most powerful, the plants produce flowers at the axils instead of the flower-buds, as in the expansion which produces the flowers of the narcissus. These are an intermediate grade between the leaves and the ordinary parts of the plant forming the flower. It is a law of vegetable development, and a fixed rule of nature, that the leaves are never developed side by side in the same plane, but opposite each other, or in other positions above or below. The leaves are either alternate, or of opposite characters; and this constitutes a division of natural families. In the examination of plants minutely, we shall find that the alternate or opposition in the disposition of leaves will alter; the cause of this is, that the alternate interlobes, or vacant spaces which are abortive, are occasionally developed as in the luxuriance of spring. The flowers of plants are composed of a series of metamorphosed leaves, developed on the flower stalks, and assume the forms of stamens, pistils, &c. When they are destitute of corolla and calyx, the flowers are called naked. The calyx is sometimes called the perianthium, and occasionally assumes a brilliant hue, as in the fuchsia. Where the parts of the calyx are united together, it is called monosepalous; but where divided, polysepalous. Strictly speaking, however, there is no monosepalous calyx, because every one is composed of verticillate leaves. The metamorphosed leaves also form the corolla, and it is distinguished as mono or polypetalous. If in any instance the sepals of the calyx are opposite the petals of the flower, it is occasioned by the abortion of a series, which we are in many instances able to trace. In some flowers, intervening between the petals and

sepals, are other organs, which were called by Linnæus nectaria or honey cups. These were supposed by some to be the organs which secrete honey; they are the blue parts of the passion-flower, and are called by botanists the corona. They are intermediate transformations between the petals and the stamens, and in some are more or less perfect: they may be regarded as a series of stamens destitute of tips. The foot-stalk of the leaf may be compared to a stamen; and its blade bent and doubled in many forms into a case, will readily explain the different forms of the flower.

Double flowers are larger flowers, the result of a greater development in the plant. In the water lily, the number of petals is very considerable; if we examine one when in flower, we can trace the regular change from the white petal to the yellow stamens, the latter being only partially folded leaves. In the centre, the color is perfectly developed, though the other parts are not; the yellow color being owing to the partial development of pollen. This pollen is a fine powder, escaping from the vessels which contain it, as if they were opened by a spring and scattering all around. The pollen is composed of a thin cellular membrane containing a fluid or mucous matter. On examination by the microscope, it will appear as if there were a certain number of bodies floating in every direction, circulating as if alive. The organs in the centre are called pistils, from an architectural term. They consist of the ovarium, the stigma and the style: the ovarium becomes the seed vessel, and developes a certain number of minute bodies called ovules. The modified leaves, forming the pistillum, unite at the margins, at a distance from the middle rib, and form a cavity by the folding in of the leaves.

The seed may be called the egg of the plant, and is produced from the reciprocal action of the stamens and pistils. A communication must always take place between the pollen of the anthers and the stigma of the pistil, before reproduction can take place. At the time when the tips of the stamens burst, the tops of the stigmas are always moist, sometimes to such an extent as to assume the form of a drop of water, more or less according to the nature of the plant. It was conceived by the earlier botanists, that the dust adhered to the water on the pistils, and that the minute particles dissolved in this secretion were taken up and transferred to the seed; but the mode by which its impregnation takes place is altogether conjectural.

It is supposed, by Adolphe Brogniart and others, that wherever the particles come into contact with the fluid, they extend into a tube, and that these tubes penetrate into the basis of the pistillum, even to the seed itself, where we can always detect a minute hole; and he even states that he has seen the tubes. In the present state of botanical knowledge, this inquiry, however, is more curious than useful. It is found impossible to impregnate certain seeds with some others; and this is probably owing to the difference in the size of the pollen, which varies greatly, some also differing in form—the globular form, however, being the most common. It may be owing to the tubes being too large; and it may also here be stated, that it is not always the largest flowers or anthers that produce the largest pollen. The advantage derivable from this knowledge, is in the culling of anthers, and sprinkling pollen to produce different varieties in plants, which produce individuals resembling neither of the parents. It is thus that we obtain all the immense varieties of tulips, there being only two or three from which originally they are all derived. In the same manner the countless number of dahlias are derived from but two or three varieties; and it is undoubtedly from the impregnation of the seeds of one plant with the pollen of another, that plants are thus multiplied. Nature often acts by these means; bees and flies, when feeding on honey, rubbing against one flower, there depositing the pollen they have collected from another. It is, perhaps, from this circumstance, that curled parsley produces the wild, from having mixed with its flowers the pollen of the wild parsley: the golden pippin may thus turn into the austere crab. From hence arises the uncertainty in the cultivation of culinary vegetables and fruit trees. Mr Ray mentions a singular instance of this, in which, from an ignorance of this botanical fact, one John Behal, a gardener at Brentford, suffered to a considerable extent. He had sold large quantities to many individuals of cauliflower seed, which, however, when cultivated, turned out to be Brassica Longiflora, or Brussels sprouts, and for which he was tried in one of the courts of law, and condemned to pay a considerable sum, for what was considered an imposition. The fact of the impregnation of plants in this manner, was not a discovery of Linæus; and the theory of the propagation of plants was for some time a matter of considerable dispute. Tournefort, Adamson, and others, treated these views as chimerical. The first experiment that decided it was made

at the Royal Academy of Berlin. The palm tree is produced from male and female trees; and for thirty years, amongst a considerable number of these, there was not one fruit-bearing tree. A male plant of the same genus was brought from Leipsic and planted near; upwards of one hundred young fruit were now produced, and the following year eleven young trees made their appearance. This circumstance, although not generally known, seems to have been understood by the ancients, who, knowing some trees were barren, planted others near to make them fertile. The Arabs always act the same in their date plantations; and Knapper relates, that in an invasion of the Prince of Bassorah, he threatened to destroy all the male date trees.

A remarkable change is produced in the formation of double flowers—the modified leaves which form stamens are most liable to this change. A curious practice in gardens has arisen from ignorance in the cultivation of the common stock, to plant one single and two double ones in the same pot; which is with the belief that the latter will cause the former, by their presence, to produce flowers. In looking for double flowers, we should mark those where there is the slightest tendency in the stamen to dilate, for it is a chance that the seed thus produced will turn out a double flower. This, which is a disease, may be perpetuated, and even carried to a great extent, in the offspring. Very few plants are naturally double flowers; but the art of man in their formation, as in every other attempt to improve the works of Nature, introduces monstrosity where she gave beauty. Generally speaking, double flowers are more luxuriant; they lead likewise to the discovery of the functions of nature. Every lover of nature must take delight in the permanent existence of many flowers which disclose their beauty, and then raise regret at their momentary duration; as well as in the creation of new forms. This lengthened duration will readily take place, and flowers of but two or three days' beauty, if the stamens are cut off at the tips, may be kept for a week or fortnight in perfection. It is the same in insects, as the females of many butterflies live for an indefinite period if the male is kept away; and the same extension of life takes place as in plants.

In the last lecture we explained the generally received theory that flowers are modified branches of the plant—that the whorls first de-

veloped, form the calyx, next the corolla, then succeed the stamens, and at last the pistils; the form being altered so that they may perform the various functions of the flower, the pistils also altering more or less, from their impregnation by the stamen. Frequently, the calyx unites with the base of the pistil forming fruit; but in every instance, it is the base itself which produces it. The pistil consists of three parts, two of which are essential to its formation, whilst the third is only subsidiary. The ovarium it is which developes the fruit; the long process is called the style, and the knobbed extremity the stigma. The stigma and ovarium are the two most important parts, the style being sometimes wanting; the use of the latter is only required to elevate the pistils to a level with the stamens, enabling the powder of the anthers to light upon it; as, although the dust is thrown out, it would probably descend without fertilizing the seed. The anther, or tip of the stamen, is a folded leaf, the margins of which are brought in contact with the middle rib, thus forming two chambers which contain the pollen.

All the parts of the plant and of the flower receive nutriment before the pistils, the consequence of which is, that if not sufficient for them, they fall short in the development; and some flowers, which have nine or ten pistils, have only one developed. This is the case with the common pea where the nutriment developes only one pistil instead of five. The number of pistils is far from constant in plants of the same species; and this irregularity is the most usual in the plants of the class Icosandria. During the progress to fruit, a great change takes place in the modified leaves, which form the cells of the ovarium; some are obliterated, others which were distinct become united, whilst some which were in union become separate: where the fruit has several cells, there is little difficulty in recognising the number of leaves which form it. In the interior of the apple are five cells, each formed of a modified leaf, and having a fleshy development around. Where the margins of the leaves meet together in the fruit, a thickening of the texture takes place, forming the placenta, and to which the seeds are attached. If we search for the seeds of the apple, we shall find the points of the pips, attached to the middle core in a particular part of the cell where they all meet. Wherever the placenta is perfectly developed, it runs from the apex to the base; and as in the pea, the part where the seeds are developed, is always the thickest part of the cell. It

is only where the part is thus thickened, that the seeds are capable of being produced, or of attaining maturity, as this is a storing up of nutriment required for its support after impregnation : where but one seed is developed in a pod, it arises on the margin, and there is not a thickening of the whole length. The indented line upon some fruits, as the nectarine or cherry, points out the part where the junction of the leaf takes place. The stigma always presents the same number of lobes as the leaves forming the fruit : the poppy has no less than twelve divisions to the stigma, and it shows twelve parts.

The partitions of the pistil are not always compact together, but sometimes, although united at first, they do not remain so; and sometimes they shrivel up altogether. Sometimes one cell of the ovarium is formed of several united pistils, from which they become abortive. Hazel-nuts and filberts have but one cell, although when examined and carefully dissected in an early state, the rudiments of three kernels are very perceptible; but nature has so arranged it, that one takes up the nutriment from the others, which stops their growth. Another instance is afforded in the cocoa-nut, which originally contains three cells; it bears three marks and three apertures through which nature meant the roots to force. Over this part the skin is very thin; but of the three only one comes to perfection, which pushes aside the others. It is only that aperture which is over the successful root that is thus thinly formed, which may easily be perforated, whilst the others are more difficultly so : the same rule takes place in many other fruits, where a single seed takes the lead and obliterates the others. Fruit has generally two sutures, as in the pea or bean, which are called the ventral and dorsal. It is here where it generally opens to discharge the seed; but in some the fruit does not thus open, where the seed vessel decays before the seed is set at liberty. There are two forms of opening—the one called loculicidal; and the other, scepticidal.

The production of the seed is the perfection of vegetable physiology; it is the ultimate object of the growth of the plant, and it seems as if nature had produced that beautiful apparatus, the flower, for no other purpose. The seed is divided into three parts; there is the external covering or skin, consisting of two or more coats, bnt always two, and enclosing the kernel. This last is a nucleus of two distinct bodies; first the albumen, and second, the embryo or

the future plant. The albumen is the nutritive matter for the support of the plant; many ripe seeds contain no albumen, the embryo occupying the whole portion. Here nature has provided other means for supplying it, in the absorption of nutriment from the soil. Every seed in a detached state exhibits a scar, which in the horse-chestnut may be recognised as a black patch; this is the point of union betwixt the seed and the vessel containing it: it is generally termed the base of the seed, though the apex is not always opposite to, but often very near the scar. In all seeds we find a very minute aperture; in some sufficiently large to be recognised by the naked eye, but which is not then sufficient to admit the point of a needle, through which the impregnation of the seed by the pollen takes place, and which is usually known by the name of the foramen. To botanists the observation of this aperture is valuable, as indicating the part where the radicle of the future plant is situated. The point of union at the lobes of the seed, is the growing portion of the plant; one portion of it is the plumula, which developes the leaves, and the other is the radicle of the young root. Where they join, the vital principle is situated, which is commonly termed the corculum or little heart. The plumula and the radicle, although very minute, never invert their functions; and in this way, the seeds of a flowering plant differ from those of non-flowering ones, where whatever part touches the earth forms the root, and the other part the stem. In the seeds of a flowering plant this does not take place as the functions cannot be inverted. A most important distinction in flowering plants is derived from the structure of the seed; where there is only one lobe it is termed monocotyledonous, but where two, dicotyledonous. The bean and pea are instances of the latter, and throw up two seed-leaves; whilst the onion is of the former throwing up but one. There is no part of botany more important than the evolution of the seed; the first step is called germination, and takes place sooner in some plants than in others. In wheat it takes place in from twenty to twentyfour hours; in barley, in seven days; in common garden beans, from fifteen to twenty days; and in parsley, from forty to fifty days, and in some instances even three months; from which torpidity has arisen the common saying "that parsley seed goes nine times to the devil before it comes up." The peach and some others are much longer; but nature has provided many with a fleshy covering, that softens the kernel, and enables germination to take place sooner.

The necessary agency concerned in the growth of plants is that of temperature, water and air. It was formerly supposed that light was also necessary, but experiment show that the growth of plants is retarded instead of advanced by exposure to it, and Nature has so ordered it that the seed lies buried under the ground to preserve it against this influence. Water is indispensable; and is equally the solvent of nutriment for animals and vegetables. Atmospheric air is equally essential, and oxygen gas seems to be the great principle of excitability to all organic matter: it gives the red color to the blood, and effects a similar excitability to vegetables in germination. We have been told that peas will grow *in vacuo*, but the experiments of Homberg, in the latter part of the seventeenth century, are by no means conclusive on the subject of the growth of plants, under circumstances in which they are deprived of atmospheric air. He stated that under the exhausted receiver of an air-pump, the seeds of lettuce, parsley, and cress, would come up, but that they would perish soon afterwards. It may, however, be easily understood that this experiment is not conclusive, from the circumstance that it is not possible by an air-pump to obtain an actual vacuum, as the air becomes more rarified and extended in its bulk; and that some seeds of less excitability would last longer under such circumstances than others. When the seed germinates a quantity of sugar is formed; this attracts the birds, which are so destructive to the seed when it begins to sprout: oxygen is required to produce this change. In malting, the same process of making sugar occurs—the seed being made to grow, and then the growth is stopped. When the seed is first germinated, mechanical and other changes by moisture are developed. The influence of light has been supposed to influence germination, by its decomposing carbonic acid gas, and hardening the seed; but experiments show that it will not harden—that plants will germinate—and that no less sugar is formed when they are exposed to light. This experiment may be easily shown, by confining mustard seeds in a closed glass; and the carbonic acid gas produced may be recognised, by its immediately extinguishing a lighted taper introduced into it.

The seeds of some plants are very numerous. Ray calculated that from one to two thousand tobacco seeds would not weigh a single grain, and Woodward pointed out that the seeds of the thistle are still more numerous. The means that nature has provided for

their dispersion is not the least wonderful part of her economy. Some possess wings, as in the feather or cotton grasses, and the dandelion. The feather grass is furnished with a long style at a particular angle, acted upon by the slightest current agitating it. It grows on the summit of high mountains, and is driven to the light crevices of the rock or loose soil, where the wind driving it round, it perforates as with a screw, the bottom part possessing the power of an augur to perforate the earth, and place it in a firm position. This is not, however, the only instance in the economy of seeds of the adaptation of means to an end. Many, as in the cocoa-nut, possess a firm and light fabric, to buoy them up in the water against the waves. This tree grows near the ocean shore, and the seeds become wafted for many miles, from island to island, and even continent to continent, this fabric also preserving the nut against the action of the sea-water: Mr Foster, who accompanied Captain Cook in his travels, gives an account that they are met with in almost all the low coral islands. Man has annihilated many animals, and species which formerly had existence are now extinct; but vegetation mocks all his labors at her destruction, whilst she is undermining all his fabrics, and reducing his proudest structures to their original dust—the minutest mosses being constantly at work for this purpose.

The present, the learned Professor observed, concluded the proposed course, which had necessarily been restricted on many subjects deserving of more lengthened notice; and he would now offer a few observations on the study and utility of botany. Many regard it as a study of mere amusement—let it be so. They suppose that the study gives very little satisfaction, that the form of plants is simple, and their organizantion very minute,—such may be the case. We are, however, daily acquiring more knowledge upon this subject and it is not forms alone which are the objects of the botanist's study. It has produced many, and those the most important, effects upon chemical and mechanical science. Many errrors arise from a misconception of effects; nature to be comprehended must be read in detail—and he who binds himself to one study is like the geologist who frames a world upon the model of his native mountains, or the geometrician who would calculate a polygon from one of its angles. The influence of vegetation may explain many changes which have taken place. Many assert that the obvious change and

amelioration of the climate of our own country is produced from a very distant cause—the felling of forests in North America. It is only by studying it in all its connexions that we can properly appreciate knowledge or advantages derivable from it. The history of mankind is in some respects connected with botanical science. If we descend into the depths of the earth, we shall find the floor covered with numerous species of plants not now known to exist, which furnish undeniable evidence of a world gone by; and give proofs of our own insignificance, when we view traces of the bounty of Providence to myriads gone before. These collateral branches are of very great importance; and those who pass them by, take but a very scanty view of the subject. It may be urged, that the busy pursuits of a laborious profession, and the incessant toils of life, would afford little time for its cultivation; but so little do we know of the subject, that almost every one may devote his time to acquire new knowledge, and add to the already realised stores. It is not the water of the Mississippi that makes the ocean, but the thousand tributary streams that flow and add their contributions to its course; the snow that falls and caps the mountain in eternal winter, is not the produce of one but many seasons. The skilful artizan sets the machine in motion by rubbing off the grains of sand; and the rill that sparkles from the mountain may become a mighty cataract. So it is with the cultivators of science; and a host of philosophers are forgotten when the names of Newton and Linnæus survive. The humblest votary can confer an advantage upon the science which he cultivates, and trace new views of Providence and its beneficence.

ART. II.—*On Improvement in Horticulture. Read before the Horticultural Association of the Valley of the Hudson, by* J. BUEL, *on the 28th Sept.* 1838. *Published at the request of the Association.*

RECENTLY notified that the gentleman selected to address you on this occasion, would fail in the performance of that duty, I have hastily prepared some remarks on the objects and promised utility of this association, which I beg leave to read.

Our first parent was placed in a garden, and commanded "to dress and to keep it;" thereby indicating, from the highest authority, that the garden is pre-eminently fitted for the performance of our highest duties, and the gratification of our purest pleasures. This construction of the divine precept, is in accordance with the opinions of every enlightened age and nation. The garden has, by general consent, ever been considered a source of utility and of healthful employment—the best theatre for concentrating and displaying the beautiful and wonderfully diversified varieties of foliage, flowers and fruits of the vegetable world—and a school for civilizing and socializing man, and of inspiring him with love to his creator, and good will towards his fellow-men. Nor does the injunction seem to refer to the mere gratification of animal appetite;—for we read, that "out of the ground made the Lord God to grow every tree that is pleasant to the sight, and good for food."

Gardening and Horticulture are in a measure synonymous terms. Gardening is divided into branches. It "is practised for private use and enjoyment," says Loudon, "in cottage, villa and mansion gardens; for public recreation, in umbrageous and verdant promenades, parks and other scenes, in and near large towns;—for public instruction, in botanic and experimental gardens;—and for the purposes of commerce in market, orchard, seed, physic, florists and nursery gardens." In all of these departments of Horticulture, we have great room for improvement, and great need of it; in all of them it is the object of this association to promote improvement, and in all of them they will effect improvement, if their efforts are seconded, as I trust they will be, by the intelligence, the taste and the public spirit of the opulent gentlemen of our valley. It is the object of the association to introduce into this—our Eden—"every tree that is pleasant to the sight, and good for food"—to introduce and to disseminate

widely, all that is useful and ornamental in garden culture—all the fruits, flowers or culinary vegetables, that are worthy of culture, whether of foreign or domestic origin, which our soil will grow, and our climate mature.

It is not enough that many of the choice productions of the garden should be found with a few of the opulent. Those that are excellent should be known and disseminated widely. We should do good to others, if we would know the pleasures that spring from a generous philanthropy. By bringing these productions together at our semi-annual exhibitions, showing and comparing them, we can determine their relative merits, their proper names and synonymes,—can publish the result of these comparisons, and recommend and disseminate those which possess the greatest intrinsic merit. "All men will eat good fruit that can get it," says Sir William Temple; "so that the choice is only, whether one will eat good or ill;—and of all things produced in a garden, whether of salads or fruits, a poor man that has one of his own, will eat better than a rich man that has none." We seek to extend the luxury of good fruits to all, in order that the poor man who has a garden, may eat better fruit than the rich man who has none.

As I have remarked, gardening is co-existent with man. Its early history is too obscure to be traced. Suffice it to say, that in the best days of polished Rome, it was cultivated with taste and assiduity, and ranked with the fine arts; and that with these it sunk to obscurity in the downfall of that empire. All of the art that survived the shock of Vandalism in Europe,was preserved and cloistered with the monks during the dark ages. With learning, it revived first in Italy and Holland; to which countries many exotics, and a taste for cultivating them, were introduced during the crusades. It was not until the reign of Henry VIII. in the beginning of the 16th century, that gardening attracted much attention in England. Previous to this time, cabbages, and even pot herbs, imported from Holland, constituted luxuries, found only on the tables of the opulent. During this reign, apricots, melons, herbs and esculent roots, were first introduced into the royal gardens. Among the new plants of that day is mentioned "the lilacke trees, which bear no fruite, but only a pleasant flowere." Improvement in Horticulture was greatly extended under Elizabeth and Charles I. During the reign of the latter, the first work upon English gardening was

published by Parkinson, under the title of "a garden of all sorts of pleasante flowres, with a kitchen garden, of all manner of herbs and roots, and an orchard of all sorts of fruit bearing trees," which is yet quoted with high commendation.

About the middle of the 17th century, several valuable publications upon Horticulture appeared in England and France; and in 1734 Philip Miller published his celebrated Gardeners' Dictionary, an original work of merit, which attracted general notice, and gave a new impulse to improvement. British and other foreign works upon gardening have been greatly multiplied; and improvement has kept pace with the increase of wealth and refinement, until horticulture has attained to a high state of perfection, as a science as well as an art in most of the civilized countries of Europe. No gentleman of opulence or taste there, deems himself fitted to enjoy the comforts and luxuries of life, without his garden. Horticultural societies have been every where established,—princes have been competitors in them, for honorary rewards; useful and ornamental plants have been sedulously collected from every quarter of the globe and innumerable new varieties have been added to the catalogue by the skill and industry of man. Within a few years, the splendid Encyclopædia of Gardening, has been added to our horticultural works by the indefatigable Loudon, professing to give all that is interesting in the history, and all that is useful in the science, or in the practice of gardening. The society of London established a garden in 1818, and sent agents into every quarter of the world, to collect whatever could be found useful or ornamental. One of these agents after traversing the United States and the Canadas, spent four years on the Pacific coast of our continent, exploring the country from California to the mouth of the Columbia, and thence across the continent to the Hudson Bay Factories, in collecting rare plants and seeds. In a subsequent voyage to the western border of our continent, this indefatigable agent was destroyed by a wild bull, upon one of the Pacific Islands. Yet the name of Douglass will be perpetuated in the cognomen of several new plants which he first brought into notice. Some idea may be formed of the extent of this society's labors and usefulness from the facts, that in its catalogue of 1830, are enumerated as growing in its garden, 3,400 varieties of hardy edible fruits, and 58 varieties of nuts, exclusive of 89 varieties of the fig, 182 of the grape, 56 of the pine apple, and 131 of the melon;

nearly all of the four last named being cultivated in houses, with the aid of glass and artificial heat,—making an aggregate of about 1,000 varieties of fruits, which administer to the sustenance of man, independent of ornamental plants, which exercise a benign influence upon his mental enjoyments. The fruits in this garden have been classified, as it regards size and quality,—their form, color, use and time of maturity noted, and their catalogue thus affords a guide in the selection of fruits for the climate to which they may be transferred for cultivation.

Enterprise in the acquisition of new fruits, and new plants, has not been confined to the London Horticultural Society. European governments, Horticultural societies, opulent amateur florists, and professional nursery-men, have sent their agents into remote parts of the world ;—and the towering mountains of Asia, the Isles of the Eastern Archipelago, the burning sands of Africa, the inhospitable regions of Siberia, and the wilds of America, have been alike explored, for valuable and rare plants, to subserve our wants, and administer to our pleasures. The fruits of all their laborious researches lie within our reach, and a prominent object of this association is to transfer to the valley of the Hudson such of them as may be found to administer to the wants and comforts of its population.

We are particularly indebted to the Flemings, for a great number of excellent new varieties of the pear. To the labors of Dr Van Mons, of the University of Louvain, an amateur pomologist, we are indebted for about 400 new and excellent varieties of this esteemed fruit, some of which are in eating through the circle of the year. The late Mr Knight, till his death, president of the London Horticultural Society, also produced many new and excellent varieties of fruits by artificial fecundation. Samples of several of the new fruits thus produced by Mr Knight and Dr Van Mons are now exhibited upon your table.

From the comparatively restricted means of a new country, gardening has with us been limited to the useful, seldom aspiring to taste and elegance. But even in the useful branch we have ample room for improvement. We have no great central point for collecting and comparing the indigenous fruits of our country, and for disseminating the excellent through our land. Of the apple, plum and peach, it is believed we have as fine native varieties as are grown in the world, and yet they are but partially known and but partially

enjoyed. Individual exertions are too limited and feeble to effect the desired object. It can only be done by the combined exertions of many, influenced by a common impulse, and directed to a common end. In this age, no great good can be effected in any branch of public improvement, without the concentrated exertions of associate bodies. The garden culture of fruits and esculent vegetables, has hardly yet commenced in many districts of our valley, while in other districts the culture is but imperfectly understood—the relative merits of different varieties are not appreciated, are their value, in promoting the health, economy and comforts of a family, unknown or disregarded. Few of the fine varieties of fruit, or of the other choice products of the garden, are seen in passing through our country. Yet twenty years has done much to improve our Horticulture; and we have abundant reason to anticipate far greater improvements in the twenty years to come.

How few of our garden products, which are now considered, at least in imagination, indispensable to our wants, and the natural products of our country. Hardly one in twenty is indigenous in our soil. Our fathers have been collecting them, and we have been collecting them, through the lapse of centuries ; and yet, how comparatively small is our stock compared with what Providence has provided for the wants and comforts of man. We are strangers to many that grow naturally in our country. And as to varieties, nature and art are every year multiplying to them, under the same laws that multiply the breeds of our domestic animals, and that are diversifying the human countenance. Did our gardens contain only the plants that are indigenous to our country, the supply would indeed be scanty. But Horticulture has laid almost every clime, and every country, under contribution, to administer to our wants, and to gratify our senses. Most of our grains, and a large portion of our fruits, and esculent roots, derive their origin from other countries. The greatest part of them came to us from Great Britain and Holland, which received them from Italy, Italy from Greece, and Greece from Asia. Rye and wheat are indigenous in Siberia and Little Tartary ; rice is the natural product of Ethiopia ; buckwheat of Asia ; kidney beans of the East Indies ; the beet and onion, of Spain and Portugal. Peas came from the South of Europe, artichokes from Brazil, peppers and cucumbers from India ; the egg

plant from Africa ; the tomato from South America ; the pumpkin from Astracan ; the ruta-baga from Sweden ; the Cauliflower from Cyprus ; and the asparagus from Asia. Our fruits originated in countries equally remote from each other. Without pretending to decide upon the disputed question, whether all the cultivated apples have originated from the wild crab, or whether any of our good varieties existed here when our shores were first visited by Europeans, I can say this much, that we have esteemed varieties of this fruit now under culture, which originated on the banks of the Po and the Danube, of the Rhine and the Oder, of the Seine and the Thames, and on the shores of the Baltic and Caspian. The peach came from Persia ; the plum from Syria ; the cherry from Pontus ; the quince from Austria ; the almond from Barbary and China, and the pear from Europe. Our pot-herbs and cultivated medicinal plants, are also most of them exotics ; parsley is from Sardinia, pursley from South America, nasturtium from Peru, thyme from Spain, sage from the south of Europe, savory from France, marjorum from Sicily, rhubarb from Asia, and balm from Switzerland. So also of our flowering shrubs and plants ; the pink, the daffodil, and narcissus, are from Italy, the dahlia from Mexico, the ranunculus and anemone, from Cappadocia ; the hyderange, balsam and camellia from China and Japan ; the tulip and hyacinth from the Levant : the tuberose from Ceylon, and our finest peonies from the "Celestial Empire." And of trees we are indebted to the north of Asia for the ornamental horse-chesnut, and to the Indian islands, for the towering ailanthus. These are but a small portion of the contributions which Horticulture has gathered from foreign lands, for our convenience and pleasure ; and every year adds to the list new genera, species and varieties. Providence seems to have apportioned its bounties among the different nations, as if to admonish them of their mutual dependence upon each other, and to excite in them a spirit of christian philanthropy and benevolence.

Private gardens of great extent and beauty abound in most of the countries of Europe, and they are maintained at a princely expense. In these not only hardy fruits and vegetables are forced to early maturity, by artificial means, but most of the tropical fruits are brought to perfection, by the aid of hot-houses and walls. Strawberries, in this way, are produced for the table in April, melons in May, grapes and peaches in June, and pine apples at almost every season. It is

assumed, that in Britain, a gentleman may derive from his garden, with the aid of glass and artificial heat, a more varied and richer dessert, throughout the year, than is to be met with on the most luxurious tables in any other country. And yet the summers of England are so cool, that the peach, grape, melon, &c., requires the protection of a wall or glass, to bring them to maturity ; and even our fine Spitzenburgh apple does not ripen well there without a wall. Gardens of this description, though generally on a limited scale, may be found in the vicinage of our commercial towns, and will doubtless be multiplied as we advance in wealth and horticultural improvement. These cases of high improvement, or rather extravagant refinement, in horticulture, are not mentioned as models for general imitation. They indicate an expenditure, which few here can prudently indulge in if they would. Yet where there is the ability, and a disposition to extravagant expenditure, it may be indulged in, in horticulture with advantage rather than prejudice, to public morals and public usefulness. The examples to which we refer, furnish models of improvement, which we are at liberty to adopt on any scale that shall comport with our desires and our means.

Public nurseries which belong to Horticulture, are highly useful to all communities in which they are located. They serve to introduce and concentrate the vegetable productions of every country, which are likely to subserve our wants or administer to our rational gratification. The interchanges which take place between those of Europe and America, are now managed with such facility, that a new fruit, or a new flowering plant, which attracts notice, and acquires value, on one continent, in a year or two becomes common in the nurseries of the other. The numerous horticultural periodicals of the two continents, make us early acquainted with whatever is new or valuable in either, and a single season serves to propagate and to disseminate the desirable plant on both. In this way we have been enabled to obtain the fine new varieties of Flemish and French pears, in many instances before they had fruited in England. The dahlia, in its natural single flower, was first introduced into France, in 1801, and subsequently into England. The skill of the horticulturist has since transformed ti into a double flower, and imparted to it all the colors and tints which are gratifying to the human eye. This ornament of the garden, which is now found at all our nurseries, is termed by common consent, " The King," as the

rose has been called the "Queen of Flowers." And as regards fruits—I was instrumental in bringing into notice, seven or eight years ago, a fine new apple, the *Jonathan*, grafts of which I forwarded to Europe. Five years ago I noticed it in the catalogue of the Lon. Hort. Society, with the names of many other of our local fruits which I sent, and also in catalogues from the Island of Jersey, and from Hamburgh. The stroat apple which I sent at the same time had produced fruit in 1830, in the Lon. Hort. garden, and was classed, as it deserved to be, among the first quailty of apples. The ailanthus was first brought to our country eight or ten years ago, by one of our consuls, from farther India, and it is now growing, I believe, in almost every state of the Union.

As having particular relation to those who depend upon market gardens for horticultural productions, for daily use, I take occasion to remark, that the quality of market garden productions depend materially on the judgment and liberality of the buyer. The object of the gardener is profit; and so long as the purchaser regards the price rather than the quality, he will continue to raise those varieties which give him the greatest products, which are generally those of inferior quality. The difference in the varieties of the same vegetable are manifestly great. This exists not only in their flavor, but in their nutritious and healthful properties: some varieties particularly fruits, being absolutely prejudicial, while other varieties of the same species, are highly conducive to health. In the potato, for instance, the difference in nutritive matter amounts to nearly a half in different varieties. Some of the coarser kinds yield but 14 and 16 per cent. of nutritive matter; while some of the finer kinds have given 28 per cent. And it is worth regarding, that good quality is almost inseparably connected with grateful flavor.

Horticulture as an employment, is highly conducive to the healthful vigor of the body, and to an agreeable exercise of the mind. The labor it demands, is neither severe in degree, nor monotonously tiresome in kind. It affords continued change and variety. The interesting objects of which it has cognizance,—as the germination of the seed, the development of the leaf, the growth of the stock and branches, the expansion of the flower, the swelling, maturing and gathering of the fruit, and the diversity of foliage, flowers and fruit, of the various vegetable families under its care, present to the mind, capable of appreciating and admiring the beauties of the vegetable kingdom, a succession of the most agreeable sensations.

As a recreation, Horticulture offers all the pleasures I have enumerated, without the fatigues which accompany its manual operations. What more grateful, to the sedentary and the studious, or to him who is habitually involved in the mercenary cares of business, than the relaxation afforded by a well kept garden, which exhibits to the senses the fragrance, the beauty, the order and harmony, which Providence has imparted to the vegetable kingdom. Here is nothing to awaken jealously, to excite distrust, to beget envy—or to inflame any of the grosser passions ; but every object is calculated to tranquillize the mind, to soften down the asperities of his nature, and to beget, towards his fellow beings, feelings of kindness, philanthropy and love.

As a science, Horticulture is rich in stores of intellectual wealth and usefulness. It embraces glossology, which teaches the names of parts of plants ; phitography, or the nomenclature and description of plants : taxonomy, or their classification ; vegetable organology or the external structure of plants ; vegetable anatomy, or their internal structure ; vegetable chemistry, or primary principles of plants ; vegetable pathology, or the diseases and casualties of vegetable life ; vegetable geography and history, or the distribution of vegetables, relatively to earth and to man ; and the origin of culture, derived from the study of vegetables.

It also embraces the study of the natural agents of vegetable growth and culture,—as earth, soils, and manures ; the agency of light, electricity, heat and water, in vegetable culture, and of the atmosphere in vegetable development.

Whether we regard Horticulture as an art, or a science ; whether we consider it as administering to our wants, convenience and pleasures, or as promotive of health and useful knowledge,—it has high claims to our notice and regard.

I present upon your table, for examination, gentlemen, more than one hundred named varieties of the apple snd pear, collected from my grounds, which twenty years ago were a barren waste ; and I might have added many others of doubtful or inferior character. Those presented have all been recommended as superior fruits, at the season of maturity, either for the dessert, the kitchen, for preserves, or for cider. They are the natural products of the northern and middle states, of Canada—and of Russia, Germany, France, the Netherlands, and Great Britain. They include of course only late autumn

and winter varieties. Yet these fruits form but a small portion of the kinds which are to be found in our valley—much less in our country. Though we have a great many good kinds, there must be but comparative few that can be denominated *excellent* or *best*. The only way to determine which are the best, is to bring the different varieties together, and to judge of them comparatively, at the season of their maturity. How desirable it is, that when starting in our pomological career—when selecting the fruits that are to administer to our enjoyment and our profit, through life, we be able to select the best kinds? But who is now a competent judge in these matters? What individual knows the comparative merits of half or a quarter, of the fruits which abound in our land? Not one among us, I venture to say. How shall we then acquire the requisite knowledge? We have at present no competent guide to direct us in the selection. Individual effort is incompetent to the labor of classifying and describing all our best fruits. It can only be effected here, as it has been done in England, by the joint efforts of an association—by bringing together the various kinds, testing their qualities, and establishing a standard of their relative merit, for the various uses for which they are adapted. This subject is so deeply connected with the comfort of all classes of our citizens—of the buyer as well as the cultivator of fruit—that I venture to recommend it to the early attention of the association.

The introduction of new and valuable varieties of fruits, seeds and ornamental plants, from different sections of our own country, as well as from the old world, should also engage our early attention. Many facilities present for effecting this. First, by a correspondence, and interchange of plants, seeds and fruits, with horticultural associations at home and abroad. Secondly, through the depot established at Washington, under the direction of an enthusiastic friend of rural improvement, H. L. Ellsworth, Esq., the commissioner of the Patent Office. Thirdly, through our naval, commercial and travelling citizens. Our corresponding Secretary, who has tendered his resignation in consequence of being about to take up his residence for some years in France, has kindly tendered his services in this behalf—and his services there in forwarding the objects of the association, may be rendered extensively useful. After all, much, very much, will depend upon our individual exertions. If we show a spirit to go ahead, and to be useful to the community, assis-

tance will be tendered from every quarter. But only those who *do* exert themselves, can, or ought to expect assistance from others. We must put our own shoulders to the wheel, before we can call upon Hercules. We *can* render this association pleasant and useful to ourselves, and highly beneficial to the public, if we but resolve to do so. But unless we set out and persevere, in the resolution to do so, we had better suffer the association to die in embryo, and to forget that we had the ambition to be useful in promoting horticultural improvement, but lacked the resolution and the spirit to carry out our laudable design.

In conclusion—to the gentlemen who have interested themselves in getting up this exhibition, and particularly those of a sister state, whose contributions of superior fruits and flowers afford the strongest incentive to perseverance on our part, I feel myself authorized to tender the grateful acknowledgments of the association. A multiplicity of circumstances, and I may say of misapprehensions, combined with protracted bad weather, have tended very much to diminish the interest of our first exhibition ; and yet I believe I may venture to say, that there has never on any occasion, been collected in our state, a greater number of excellent varieties of fruit,or finer samples, that has been exhibited on this occasion ; and although the season has been highly unpropitious to the floral department, yet the exhibition of fine dahlias, the favorite flower of the season, has been peculiarly brilliant. We have no reason to despond, but much to induce perseverance and renewed exertion. We have laid the foundation of improvement in that branch of industry which administers largely to the wants and elegancies of life. We can rear the superstructure. We can *deserve* success, though we cannot *command* it. And even the high satisfaction of doing this, is a consoling, if not satisfying reflection, to him who derives pleasure in laboring for the public good.

Art. III.—*Cultivation of the Strawberry.*

The number of varieties of this delicious fruit enumerated in catalogues, are very numerous. The late President Knight considered them all as having originated from one species, while others regard them as properly divisible into several species. Passing from the notice of these, it may be useful to cultivators in this country to give brief description of the different classes into which the numerous varieties are divided. Mistakes in names are frequent, and this may assist in rectifying them.

Class I, includes *scarlet strawberries*, and the general character is thus described by Loudon: — "Leaves nearly smooth, dark green, of thin texture, with sharp pointed serratures; the fruit mostly of small size, and bright color, with the seeds more or less deeply imbedded between ridged intervals; the flavor acid, with slight perfume." Examples, Roseberry, Methven Scarlet or Methven Castle, Old Scarlet, &c.

Class II. Black Strawberries. — The General character is, "leaves rugose, (or swollen between the veins,) pale green, and small; fruit conical with a neck; seed slightly imbedded; flavor rich and highly perfumed." Examples, Downton, Pitmaston black, Elton seedling.

Class III. Pine Strawberries.—Leaves almost smooth, dark green, of firm texture, with obtuse serratures; flowers large; fruit large, varying from almost white to purple; seeds prominent on a smooth surface; flavor sweet and often perfumed. Examples, Keen's seedling, Carolina, Mulberry, Southborough seedling.

Class IV. Chile Strawberries. —"Leaves very villous, hoary, with small leafets of thick texture, with very obtuse serratures; fruit large; seeds prominent; flesh insipid in the True Chile, and more or less so in the varieties which have originated from it." Example, Wilmot's Superb.

Class V. Hautbois. — "Leaves tall, pale green, rugose; scapes tall and strong; fruit middle-sized, pale greenish white, tinged with dull purple; flesh solid and musky."

Class VI. Green Strawberries. — Characterised as the *Fragaria collina and F. viridis* of botanists, the varieties of which are little known and not of much value.

Class VII. Alpine or Wood Strawberries. — Characterised as *F.*

semperflorens and F. vesca. Examples, Red and White Alpine, Red and White Wood.

The following are descriptions of some best varieties :

Old Scarlet. — Early Scarlet, or Early Virginia ; fruit middle-sized, globular, of a very light scarlet color, seeds deeply imbedded, flesh pale, and very highly-flavored. Although not a great bearer, yet highly deserving of cultivation, as it ripens several days earlier than any other.

Grove End Scarlet, or Atkinson's Scarlet. — Fruit large, roundish, somewhat hemispherical, brilliant scarlet, flesh pale, with an agreeble sub-acid flavor. Remarkable for the wide serratures of its leaves. A good bearer and early.

Roseberry. — Fruit large, conical, with a very short neck, dark red ; flesh firm, pale scarlet, with a rich flavor. An abundant and long-continuing bearer.

Methven. — Fruit very large, round, sometimes coxcomb shaped, bright scarlet ; flesh pale and not firm ; flavor good, but not so rich as the preceding. Sometimes weighs upwards of half an ounce.

Downton, or Knight's seedling. — Fruit large, with a neck, often assuming a coxcomb shape, dark purplish scarlet ; flesh scarlet, firm, with a rich, juicy, and high flavor ; a good bearer, ripening late. Requires good culture.

Elton Seedling. — Fruit large, ovate, often compressed or coxcomb shaped, and not filled at the end of the berry, shining, dark red ; flesh fine deep red, firm, juicy, with a sharp rich flavor ; fruit on long footstalks, frequently projecting above the foliage ; ripens late ; must be allowed to remain on the stem till it become very dark colored, to avoid too great acidity.

Keen's Seedling. — This variety requires protection in the winter by a covering of straw, and is somewhat difficult of cultivation ; but when it succeeds well, it is an abundant bearer, and has a very fine appearance. The fruit is very large, ovate, the largest of a coxcomb shape, dark shining red, especially next the sun ; flesh scarlet, firm, of a rich and agreeable flavor ; ripens rather early in the season. It is considered the best strawberry for forcing.

Wilmot's Superb, is only to be recommended for its great size ; the fruit is round or irregularly ovate, sometimes compressed, pale

scarlet, shining; seeds projecting; flesh pale red, nearly white, and wooly at the centre; flavor moderate.

Prolific or Conical Hautbois, Hudson's Bay, double bearing, Musk, or Spring Grove. Fruit medium size, (large for this class) conical, very dark dull red, inclining to purple on the sunny side; flesh greenish, rather dry, but of a rich and highly perfumed flavor. An abundant bearer. Considered by some as the finest of strawberries. According to the London Horticultural Society's Cata logue, "of all strawberries, the hautbois are most variable." They certainly retain a general character, from which they naturally do not depart; but constancy of character in varieties, denominated as distinct, is but little to be depended upon; the fruit will occasionally change from globular to ovate, and the contrary, while fertile plantations will produce runners that may, perhaps, be sterile, and seedlings, many of which will certainly prove so. The latter ought to be carefully looked after and extirpated, which can be only effectually done in plantations newly formed while the plants are single, and at the time they are in blossom. It is also necessary to observe, that in all the sorts of hautbois here enumerated, there exist both the *Prolific*, and also these sterile plants commonly called *Males*, which have *long stamens*. The latter ought, in all cases, to be certainly destroyed." The sterile flowers are distinguished in all the varieties of the hautbois by their long stamens, except in the *Prolific*, which also has long stamens; from *this* they are distinguished by their smaller flowers, and imperfect fructification. Thompson in Loudon's Encyclopedia of gardening, says: "I believe there is no such thing as distinct plants of male and female hautbois. Stamens and pistils are to be found in either a *perfect* or *imperfect* state in every individual flower. Imperfection generally takes place in the pistil, together with the receptacle. To see that these are sound is all that is necessary to be attended to."

Red Alpine. — Fruit the largest of this class, conical, red; flesh sweet and high flavored. Bears abundantly in suitable soils and situations, from early in summer till late in autumn. We have seen a dish of them on the table picked the first day of the twelth month (December.) The *white alpine* is similar to the preceding, except the fruit is white instead of red. These two varieties are frequently grown promiscuously together.

The Red Wood and *White Wood* resemble the alpine, but the fruit is smaller and rounder.

The Bush Alpine is distinguished by not spreading by runners. It is not so good a bearer as the red and white running alpine, nor is the fruit quite as good.

The following is nearly the order of succession in which the preceding varieties ripen, except the alpines, which continue in succession.

Old Scarlet,	Prolific Hautbois,
Grove End Scarlet,	Wilmot's Superb,
Roseberry,	Downton,
Keen's Seedling,	Elton Seedling.
Methven.	

Modes of Propagation. — Strawberries multiply rapidly during their growth, by runners from the parent plant, which, rooting at every joint, form numerous new plants. To form new plantations, these need only to be removed to the bed where they may flourish. This work may be done any time in autumn, or early in the spring; the latter is best. If done in autumn, care should be taken that the plants are not thrown out by frost, especially on heavy soils. This may be prevented by treading the soil closely about the roots before the ground becomes frozen. Such beds will bear some fruit the summer following the transplanting, and will furnish an abundant supply the second season. The alpines produce well in one year.

The only exception to this mode of increasing, is the Bush Alpine, which never increase by runners; the only way of propagating this variety, is by dividing the root, and transplanting as above described.

Strawberries are only propagated from seed for producing new varieties, except the woods and alpine, which, says Loudon, "come regular from seed, bring a finer fruit than from offsets."

Soil and Situation. — The best soil for the strawberry is a deep rich loam, though they will succeed and bear on any soil which is fertile. The situation should be open and well exposed to light and air. They succeed very well when planted in single rows as edgings. The alpine and wood strawberries may be placed in a more shady situation than others; it is during hot and dry seasons of the year that they are intended chiefly for bearing. They are consequently well adapted to edgings for shrubbery. When the soil is rich, the advantage of employing strawberries for edging is great, as

they succeed in such soils much better when in single rows than when crowded together in a bed.

General Culture. — A very general error is to plant too near together, especially if the soil be fertile and well prepared. *Thorough* culture is by far the best, at the same time that it is, ultimately the *cheapest* method. It is true that on common rich garden soils, a bed may be transplanted which will produce fine fruit and good crops with little care after they are once prepared; we have known beds to yield plentifully which were almost untouched for years, not even having been weeded, the thick growth of the strawberry keeping down, in a great measure every thing else. But by the following thorough mode, or one similar, practised by Keens, of Isleworte, in England, who first raised the celebrated variety known as Keens' seedling, the greatest amount of fruit may doubtless be obtained for the care and labor expended, while the quality would be greatly superior. The soil for this mode of culture, should be trenched eighteen inches to two feet deep, and mixed with decomposed stable manure; if the subsoil be somewhat sterile, it should not be thrown to the surface. The ground should be prepared at least a month before transplanting. "The best way," says Keens, "to obtain new plants, is, by planting out runners in a nursery, for the express purpose, in the previous season; for it is a very bad plan to supply new plantations from old plants." The distances of the rows asunder are about two feet and eighteen inches in the row, for the large varieties, as Methven and Keen's seedling; the smaller varieties may be a little nearer. This distance may seem too great, but it is necessary for sun, air and culture. "These large distances," says Keens, I find necessary; for the *trusses of fruit in my garden ground are frequenly a foot long.*" This fact is a sufficient proof of the excellence of this mode of culture. "After the beds are planted, I always keep them as clear of weeds as possible, and on no account allow any crop to be planted between the rows. Upon the growing of the runners, I have them cut when necessary; this is usually three times in each season. In the autumn I always have the rows dug between; for I find it refreshes the plants materially; and I recommend it to those persons to whom it may be convenient, to scatter in the spring, very lightly, some loose straw or long dung between the rows. It serves to keep the ground moist, enriches the strawberry, and forms a clean bed for the trusses of fruit to lie

upon; and thus by a little extra trouble and cost, a more abundant crop may be obtained. A short time before the fruit ripens, I always cut off the runners, to strengthen the root; and after the fruit is gathered, I have what fresh runners have been made, taken off by a reaping hook, together with the outside leaves around the main plant, after which I rake the beds, then hoe them again. In the autumn, unless the plants appear very strong, I have some dung dug between the rows, but if they are very luxuriant the dung is not required; or in some rich soils it would cause the plants to turn nearly all to leaf. I have also to remark, that the dung used for manure, should not be too far spent; fresh dung from the stable door is preferable to spit dung, which many persons are so fond of."

In England, where the climate is much more moist and less hot than here, decided advantages are found in watering strawberries during hot weather.

Beds, once prepared, generally continue in a good bearing state from three to five years.—*Genesee Farmer.*

Art. IV.—*Artificial Manure.*

The Horticultural and Agricultural Societies of Paris have lately been directing their attention to the value of the receipt left by M. Jauffret, for making artificial manure. It was at the request of the minister of agriculture, that the Royal and Central Society of the Seine undertook the examination of this question: and M. Quenard having about the same time laid before the society two modes of fabricating manure, different from M. Jauffret's plan, it was determined to compare the respective plans together, and determine on their relative utility. M. Quenard is secretary of the Agricultural Society of Montargis, and is esteemed as an experienced cultivator. One of his manures is a species of compost, and the other is analogous in principle to the preparation of M. Jauffret. As this subject is considered of great importance in France, we have thought fit to lay before our readers a concise account of M. Quenard's method of proceeding, premising that the commissioners appointed by the Royal Society of Paris have not yet given in their report.

The mode of preparing the compost is simple enough :

1st. A layer of green stuff taken from a pond.

2d. A layer of quick-lime, ashes, and soot.

3d. A layer of straw and green grass.

4th. A layer of quick-lime, ashes, and soot.

These layers are repeated until they reach a cart load at least. Holes are then made through the several layers, and a quantity of water is introduced, sufficient to saturate the mass, and cause a thorough mixture of the vegetable matters with the alkaline and sooty substances. According to M. Quenard this produces a perfect compost. The second preparation differs from the other, inasmuch as the dissolution of the alkaline substances are first obtained by means of a prepared lye, which is used to saturate the matters which are to be transformed into manure. The following are the proportions to be used in turning 1500 lbs. of straw into manure. In a vessel possessing greater breadth than depth, pour in —

1st. 800 pints of common water.

2d. 125 pints of oven ashes, if they can be procured, as they have the property of potash to some extent ; if not, you must use the common ashes.

3d. 75 pints of soot, if possible from kitchen chimney, for this soot contains more of animal matter, and is more soluble in water. This mixture must then be well stirred up, and made to incorporate.

4th. 20 pints of powerful lime, which must be first slacked with the usual quantity of water.

The whole of this must now be well stirred together again, so as to insure a perfect amalgamation of the several matters. From time to time, during twentyfour hours, this mixing must be renewed, and at the end of that time the dissolution of the whole will be effected. This liquid will be found exceedingly powerful, and capable of producing fermentation. Plunge into this liquid, while moved quickly about, in order to hold suspended the insoluble particles which usually settle at the bottom, the quantity of vegetable substances, which it is desirable to turn into manure — no matter whether they are dry or green, easy to be dissolved or refractory, in with them. When they shall have been well saturated with the liquid, place them in a trench prepared beforehand, with a channel through the side, to let the superfluous moisture run off. This you can receive in vessels, as it will be of use again. As many layers of the stuff thus perfectly

wetted may be placed as may be required. Care must be taken to stir the liquid well, each time that new vegetable substances are put in. As each layer is put on the heap, it should be well beaten down. The more the whole mass is united together, the quicker will be the result. At the farthest, the delay never exceeds sixteen or eighteen days, according to the temperature of the place. The heat may be increased, and the fermentation quickened, by surrounding the heap with whatever substances may be lying about. At the end of three or four days, the heap is wetted with the liquid, from time to time, up to the sixteenth or eighteenth day, when the manure is found ready for use. It is important to preserve a certain quantity of the first preparation, to mix with the mass afterwards, to promote fermentation. Time and quality will both be gained in this manner. This part of the liquid thus preserved may be considered, for manure-making, what mother is in vinegar, yeast in beer, or baum for baking. M. Quenard declares, that he has for years tried this preparation, and that it never, by any chance, has been found to fail. We place it before our readers, leaving them to try the experiment on a small scale.—*London Horticultural Journal.*

Art. V.—*Royal Philipodendron,—Philipodendrum Regium.*

This plant is a native of Nepaul, and was introduced into France by M. Noisette, who met with it in England. He placed it where it is now growing, in the Jardin des Plantes, at Paris. The root which he brought over was set in an earthen pot as a greenhouse plant. After ten years, notwithstanding the care he had taken with it, it was only three feet high. M. Noisette, who had multiplied it by slips, distributed it amongst the trade under the name of *Betula bella*, and perhaps some few amateurs may possess it under that title. M. Noisette, having planted a root in the open ground, in a large tub, it became in a few years a tree of great height. On the 15th of August, 1837, M. Poiteau, who noticed its extraordinary development, perceived that it was sending forth several bunches of flowers: and after a long and mature examination, he was convinced that this tree must furnish a new species different from all those

hitherto known, and very difficult to class among the natural families already established. He applied for and obtained permission to dedicate it to the head of the reigning dynasty, Louis Philippe I.

This tree has a most particular and remarkable growth. It remains for the first ten years under the form of a small bush, without showing any inclination to rise; then it all of a sudden assumes a new shape and becomes a most beautiful tree.

At the first period it is like a thick bush, more wide than high, with a number of branches striking out with a most remarkable lightness, strength, and pliability, and which are susceptible of being used as strings or ties of great solidity. A short time ago a basket formed from its branches was presented to the Horticultural Society. When the tree is young it has a light down on it, formed with hairs in shape of stars varying in number and length. When of adult age, it becomes a pyramidal tree and of very fine appearance, but it is not yet known precisely to what height it may attain. Its branches are well fixed, and their young buds are interspersed with a sort of hair of a transparent white, of unequal length and number from two to ten—similar hairs are found on the edges and upper surface of the young leaves and the young fruits.

The flowers grow in a branchy basket shape: they are small, of a greenish color, and dicœcious, or more properly male on certain trees, and female hermaphrodites on others. The first has not been yet seen; the last exhibits the characteristics mentioned above. M. Poiteau, from whose notice this is taken, hopes that a male one will spring forth sooner or later in our cultivation, and perhaps it exists already in England. Notwithstanding the absence of it, he has discovered sufficient to constitute a distinct species. He has most learnedly discussed the place which it ought to hold in the natural families; and after having exposed the characters which bring it near the malvaceous and rosaceous plants, as well as those others that separate it from them, he proposes to consider it as the head of a new genus, and to place it among the dombeyaceous and bythneriaceous plants.

In the north and centre of France, it appears that this tree ought not to be grown in the open air, unless it can be protected from the cold. But it would no doubt succeed in the southern departments, where it would acquire the development which is natural to it, and would furnish the thready fibres to its bark. Hitherto, it has only been multiplied by cuttings. A mild and light soil suits it best.

To the Patrons of the Horticultural Register.

The publishers of the Horticultural Register and Gardener's Magazine, hereby announce to those who have heretofore patronized this work, that they have come to the determination to discontinue it after the present number. We have come to this conclusion from a number of considerations which will be unnecessary to lay before our readers; we will, however, name some reasons, which have had influence upon us.

1st. We publish, as most of the subscribers to the Horticultural Register know, the N. E. Farmer and Gardener's Journal a weekly paper, with an extensive circulation, devoted to Agriculture, Horticulture, &c. We deem it therefore, unnecessary to continue two works which may be embraced in one. We shall be happy to furnish those gentlemen who now subscribe for the Register, with the N E. Farmer if not already taken.

2d. The price of the work is not sufficient to sustain it, without a large accession of subscribers, which cannot reasonably be expected, when there is so much competition.

3d. The want of punctuality in many of its *patrons*, to pay for the work, is another strong inducement to discontinue. We would not be understood by this, however, that all the subscribers or a majority of them are delinquent; far from it, many of them have paid promptly, and they have our thanks, but there are those, who have not paid a dollar since the commencement of the work—they must not be surprised if we are after them shortly.

We publish below our prospectus for the N. E. Farmer, which we hope to furnish to all who have taken the Register. The index to the 4th volume, will be forwarded in a few days.

JOSEPH BRECK & CO.

PROSPECTUS OF THE NEW ENGLAND FARMER, AND GARDENER'S JOURNAL,

Volume Seventeenth,—commencing July 11, 1838. *Back numbers can be furnished. Published by* Joseph Breck & Co., *No.* 52, *North Market Street, Boston.*

To the Public.

The proprietors and publishers of the New England Farmer ask leave respectfully to present their claims upon the continued patronage of the agricultural community. "Shall auld acquaintance be forgot?" The New England Farmer was commenced sixteen years ago by the late lamented Mr Fessenden. The project of a newspaper devoted exclusively to the concerns and interest of agriculture was at that time a project entirely novel in New England; the success of which was altogether questionable. He brought to it the treasures of his practical knowledge; his careful observation; his varied experience; and his persevering and exact inquiry. It soon rose into public esteem, and contin-

ued a favorite of the public until his death. The vast amount of learned, practical, and useful information contained in its volumes fully justify the patronage which it has received; as it is confidently believed that in this respect no work has been more distinguished; and the same number of volumes is not to be found which are richer in varied, sound, useful, and practical knowledge.

No pains or labor have been spared since the death of this excellent friend of the farming interest, this friend of every social interest, and every useful enterprise, to maintain the high character of this journal and to extend its usefulness. These efforts, from the approbation generally expressed, have not been without success; and this success is an encouragement to persevere and to redouble these efforts. This we promise; and respectfully ask therefore the continued patronage of a reading, a working, and intelligent public.

The proprietors of the N. E. Farmer would scrupulously avoid any invidious comparisons with other agricultural papers, and desire to enter into no competition or rivalry; but they confidently believe that no paper of the same number of pages, within the last year, has presented a larger amount of original matter or of interesting practical intelligence; and their selections have been made from extensive facilities, both at home and abroad; with as much judgment as they can exercise.

They will continue to do their best. The Commissioner of Agricultural Survey will render all the aid consistent with his public engagements, and make it the vehicle of all his communications with the public. The various agricultural and horticultural societies in the state will present all their reports through its pages; and some of the best farmers in New England will continue to enrich its columns with their valuable contributions.

The proprietors hold in utter disdain all mean arts, intrigues or misrepresentations or fallacious promises with a view to obtain patronage. These would be wholly inconsistent with the principles and character which the Farmer has always maintained.

The Farmer hitherto has been eminently a family paper. Its pages have never been stained with a statement, sentiment, or expression, which would raise a blush of shame on the cheek of modesty, or infuse a poison in the uncorrupted mind. We pledge ourselves that in all these respects it shall not forfeit its high reputation.

Having been the pioneer of agricultural improvement and intelligence in the State and country, and without the inclination if it had the power, to drive others from the field, it respectfully asks only a reasonable portion of the harvest of which it sowed the seed, and in regard to which has performed its full share in the cultivation of the crop.

The New England Farmer and Gardener's Journal is published weekly in quarto form, making a handsome volume of 416 pages with an index, at two dollars and fifty cents, in advance, or three dollars at the close of the year.

Editors of papers with whom we exchange will do us a favor to publish this communication.

Boston, Dec. 26, 1838.

QUINCY MARKET.

[Reported for the Horticultural Register.]

APPLES, common,	bnshel,	50 to	75
	barrel,	1 50 to	2 00
Baldwin,	do.	2 00 to	2 50
Golden Pippin,	do.	3 00 to	4 00
Greening,	do.	2 00 to	2 50
Russett,	do.	2 00 to	2 25
BEANS,	bushel,	1 75 to	2 00
BEETS,	do.	50 to	75
BROCCOLI,	head,	12 to	25
CABBAGES,	dozen,	50 to	75
CAULIFLOWER,	head,	12 to	25
CELERY,	root,	6 to	12
CRANBERRIES,	bushel,	1 50 to	2 00
CHESNUTS,	do.	1 75 to	2 00
CARROTS,	do.	50 to	75
GRAPES,	pound,	25	
HORSERADISH,	do.	8 to	12
GARLIC,	do.	12 to	20
LEMONS,	doz.	20 to	25
ORANGES,	do.	20 to	25
ONIONS, White,	bushel,	1 25 to	1 50
common,	do.	1 00	
PARSLEY,	peck,	25	
POTATOES, Common,	barrel,	1 50	
Chenangoes,	do.	1 50 to	1 75
Eastport,	do.	2 00 to	2 50
Nova Scotia,	do.	1 50 to	1 75
PEARS, Baking,	do.	4 50	
	bushel,	1 50 to	2 00
RUTA BAGA,	do.	37	50
SQUASH, Winter sorts,	hundred,	1 50	
SPINACH,	half peck,	17	25
TURNIPS,	bushel,	25	37

Boston, December 20, 1838.